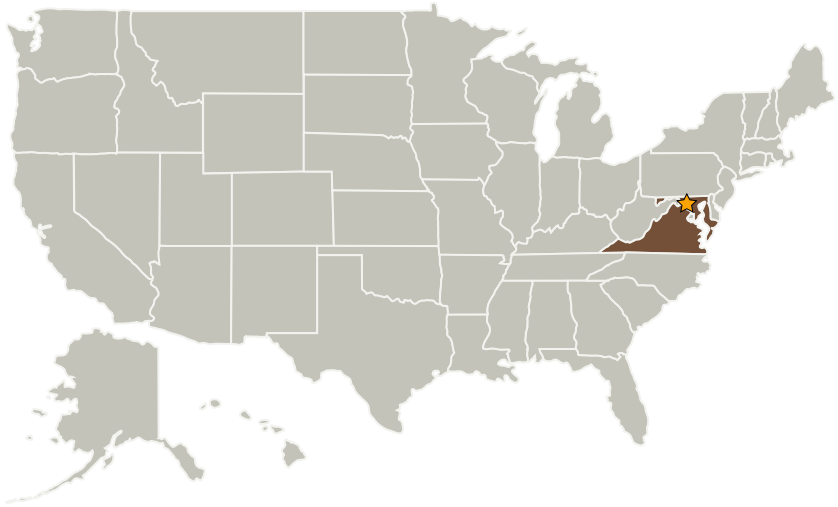
Real Time Control Software for Electromagnetic Formation Flight, Phase I

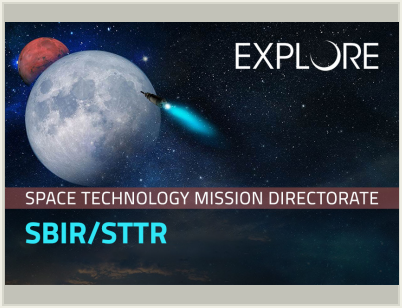
Completed Technology Project (2004 - 2005)

Project Introduction

As the focus of space system architectures changes from single, to multiple, and eventually to many spacecraft flying in formation, a greater demand on total lifetime impulse and precision control becomes unavoidable. A unique property of these spacecraft clusters is that controlling only relative positions within the cluster is normally sufficient to satisfy most metrics of performance. This opens the possibility of using inter-spacecraft forces and torques (such as those generated electromagnetically) as the primary means of control, eliminating the need for onboard propellant. Eliminating the dependence on a non-replenishable consumable (propellant) in lieu of a replenishable resource (electricity) allows even aggressive maneuvers to be repeated without limit for as along as the other subsystems last. A testbed has been developed at the MIT Space Systems that uses a combination of steerable magnetic dipoles and reaction wheels on each spacecraft allows for all relative degrees of freedom within a cluster to be controlled. Payload Systems proposes to design an avionics and software system which would not only be usable with the existing testbed, but would also be appropriate for an on-orbit demonstration. This effort would drastically reduce the risk and effort required to transition the technology from ground to flight.

Primary U.S. Work Locations and Key Partners





Real Time Control Software for Electromagnetic Formation Flight, Phase I

Table of Contents

Project Introduction 1
Primary U.S. Work Locations and Key Partners 1
Organizational Responsibility 1
Project Management 2
Technology Areas 2

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Goddard Space Flight Center (GSFC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Real Time Control Software for Electromagnetic Formation Flight, Phase I

Completed Technology Project (2004 - 2005)

Organizations Performing Work	Role	Type	Location
★Goddard Space Flight Center(GSFC)	Lead Organization	NASA Center	Greenbelt, Maryland
Aurora Flight Sciences Corporation	Supporting Organization	Industry	Cambridge, Massachusetts

Primary U.S. Work Locations	
Maryland	Virginia

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Steven W Sell

Technology Areas

Primary:

- TX17 Guidance, Navigation, and Control (GN&C)
  - TX17.3 Control Technologies
    - TX17.3.4 Control Force/Torque Actuators